Oct 18 2011

Mobile Operating Systems w/Android

Rick Rogers & Bruce Willins
Technology Solutions Group

AGENDA

- MSI Context
- Mobile Operating System Landscape
- Open Source Software & Distros
- Microsoft
- Linux
- Android
- Mobile Web

Motorola

On Jan. 4, 2011, Motorola, Inc. spun off its Mobile Devices and Home businesses, which became Motorola Mobility Holdings, Inc., and changed its name to Motorola Solutions, Inc.

MOTOROLA SOLUTIONS
GOVERNMENT & ENTERPRISE FOCUS
NYSE: MSI

MOTOROLA MOBILITY
CONSUMER FOCUS
NYSE: MMI

MSI Customers / Perspective
A Diverse Application Landscape

| GOVERNMENT | MANUFACTURING & FIELD MOBILITY | TRANSPORTATION & LOGISTICS | RETAIL & HOSPITALITY | ENERGY & UTILITIES | EDUCATION & HEALTHCARE |

Industry Expansion of the "Platforming" Paradigm

	MC1000	MC30000	MC3100	MC9090-G/K/S	MC9090-G RFID	MC9090-I-Safe/NI	MC9500-K	ES400	MC55	MC70	MC75	WT4000 Series	WT4090 VOW	VC5090	VC6096	MC90XX Forklift	MC17
INDUSTRY																	
Government - Federal	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	
Government - State & Local	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Healthcare								●	●	●	●						
Hospitality								●	●	●	●						●
Manufacturing	●	●	●	●	●	●		●	●	●	●	●	●	●		●	
PetroChem						●	●				●	●		●	●	●	
Utilities				●		●	●				●						
Retail	●	●	●					●	●	●	●						●
Transportation & Logistics				●		●	●		●	●	●				●		
Wholesale Distribution	●	●	●	●	●	●	●					●	●	●	●	●	
CROSS-INDUSTRY																	
DSD/Route Accounting				●		●	●		●	●	●						
Field Mobility				●		●		●	●	●	●				●		
Fleet Management	●	●	●	●	●	●	●	●	●	●	●				●		
Integrated Voice & Data		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Warehousing	●	●	●	●	●	●						●	●	●		●	

"Angry Platforms"

12+ Mobile OS's
49 Manufacturers
800 Devices
500+ ISVs

Linux

Subject: RE: LiMo rises from the grave...sort of

Rick,

So now, BONDI is folded into WAC…WAC is aligned and conjoined with LIMO, meanwhile Maemo merges with Moblin to form Meego..
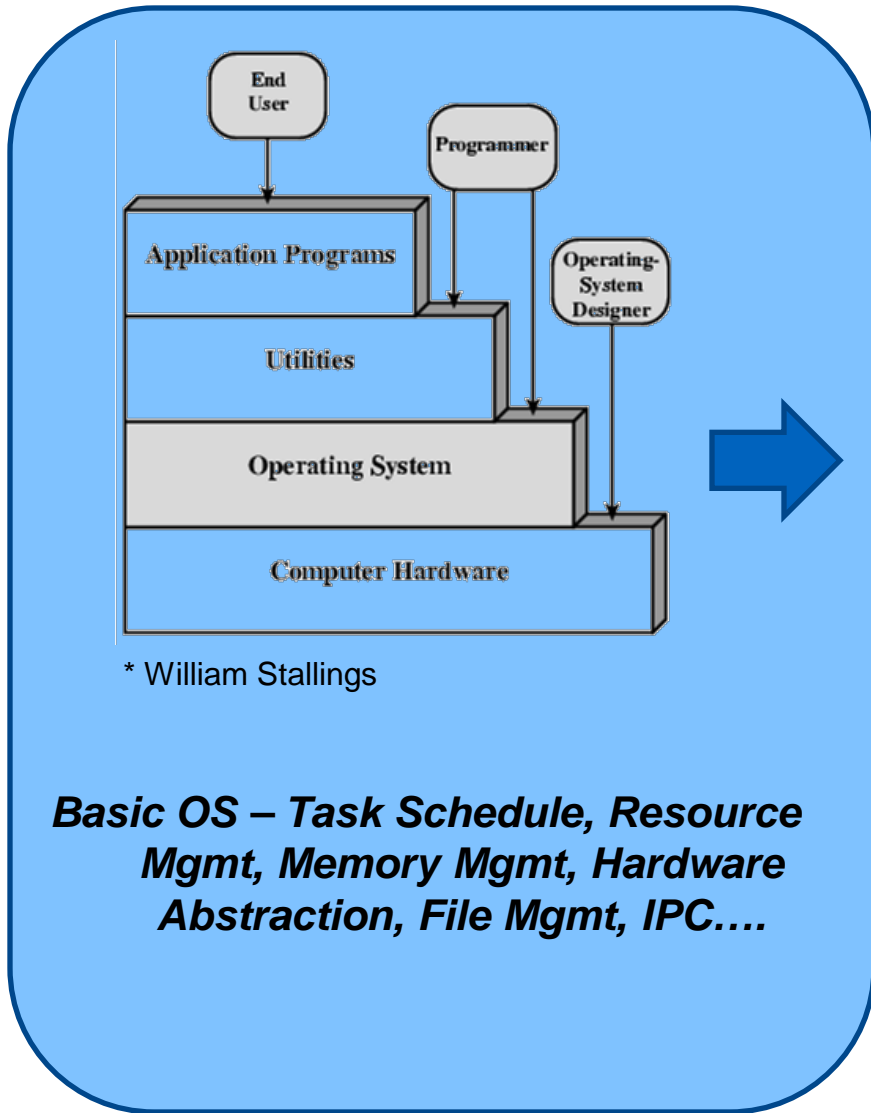which is now merging with LIMO to form Tizen….Perfectly Clear To Me.

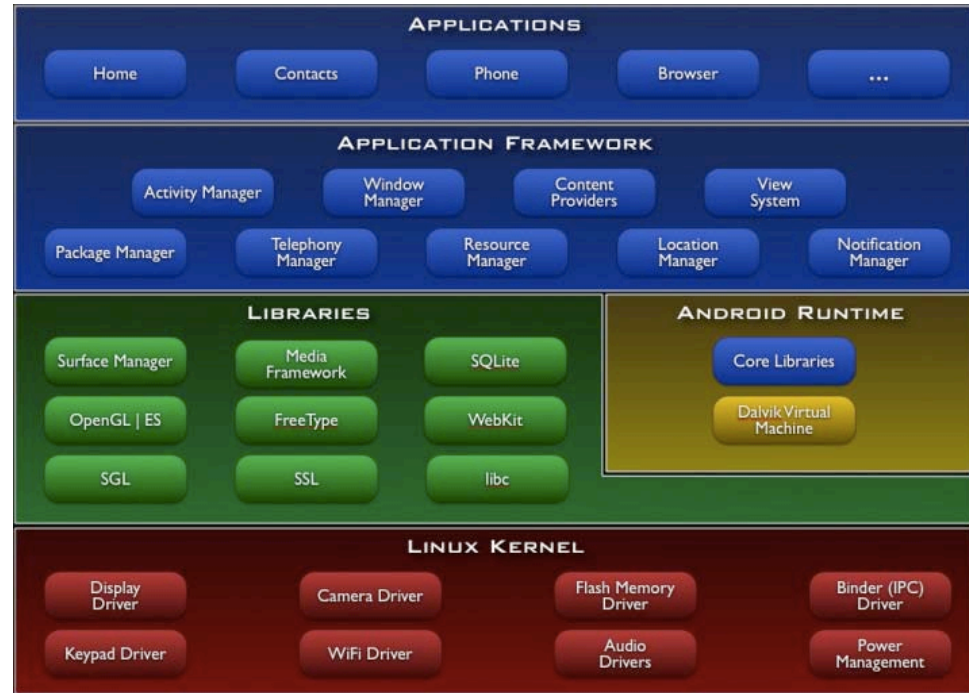Regards,
Bruce

Android Vendor Enhancements

Yi

MOTOROLA *SOLUTIONS*

DEFINITION - THE SCOPE OF WHAT WE CALL AN "OS" HAS CHANGED SIGNIFICANTLY

* William Stallings

Basic OS – Task Schedule, Resource Mgmt, Memory Mgmt, Hardware Abstraction, File Mgmt, IPC….

e.g. Android

A Fragmented Ecosystem of Development Environments, Languages, and Runtimes

	Common IDE	Programming Languages		Runtime
Microsoft (WM / WEH)	Visual Studio	**Visual C#**		.NET Common Language Runtime
		Visual Basic		
		Jscript .Net		
		J#		
		Visual C/C++ , Win32 & MFC APIs		
Microsoft (W7, W8)	Visual Studio XNA Game Studio Expression Blend	Silverlight/XAML		
Apple	X-Code	Obective-C		
Android	Eclipse	Java		DVM
	IntelliJ IDEA			
	Netbeans			
Blackberry RIM	Blackberry JDE	Java		Mobile Information Device profile Java Micro Edition
Symbian	QT Creator	C++/QT		
	NetBeans	Java		Java ME
	Carbide	C++		

MOTOROLA SOLUTIONS

Mobile Patent Suits Compound A Complicated Mobile Landscape
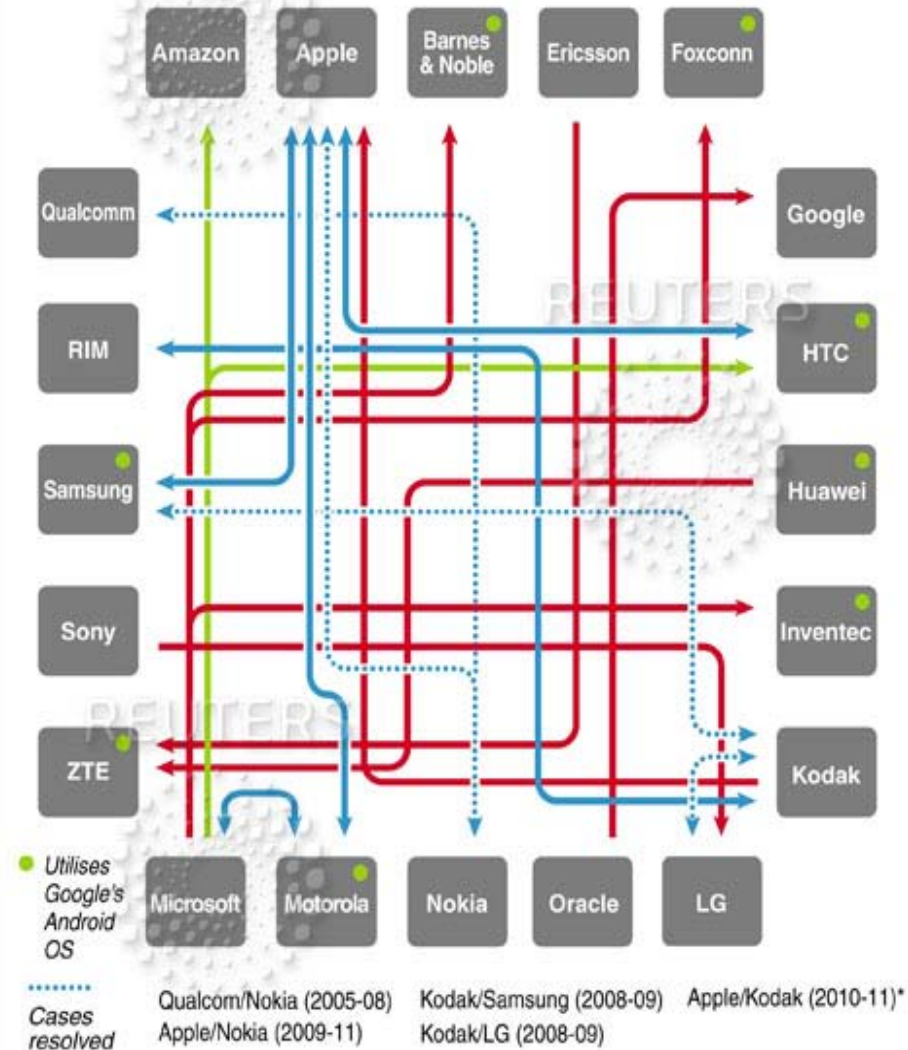
INDEMNIFICATION
PATENTS, COPYRIGHTS, TRADE SECRETS, AND TRADEMARKS

- **"It is not possible today for a nontrivial program to be noninfringing on software patents granted in the U.S" – Bruce Perens, Co-founder OSI (open source Initiative)**

- **Microsoft covers patent, copyright, trade secret, and trademark disputes**

- **Commercial Linux Distros "May" Offer Indemnification**

Table 1
Worldwide Mobile Communications Device Open OS Sales to End Users by OS (Thousands of Units)

OS	2010	2011	2012	2015
Symbian	111,577	89,930	32,666	661
Market Share (%)	37.6	19.2	5.2	0.1
Android	67,225	179,873	310,088	539,318
Market Share (%)	22.7	38.5	49.2	48.8
Research In Motion	47,452	62,600	79,335	122,864
Market Share (%)	16.0	13.4	12.6	11.1
iOS	46,598	90,560	118,848	189,924
Market Share (%)	15.7	19.4	18.9	17.2
Microsoft	12,378	26,346	68,156	215,998
Market Share (%)	4.2	5.6	10.8	19.5
Other Operating Systems	11,417.4	18,392.3	21,383.7	36,133.9
Market Share (%)	3.8	3.9	3.4	3.3
Total Market	296,647	467,701	630,476	1,104,898

Source: Gartner (April 2011)
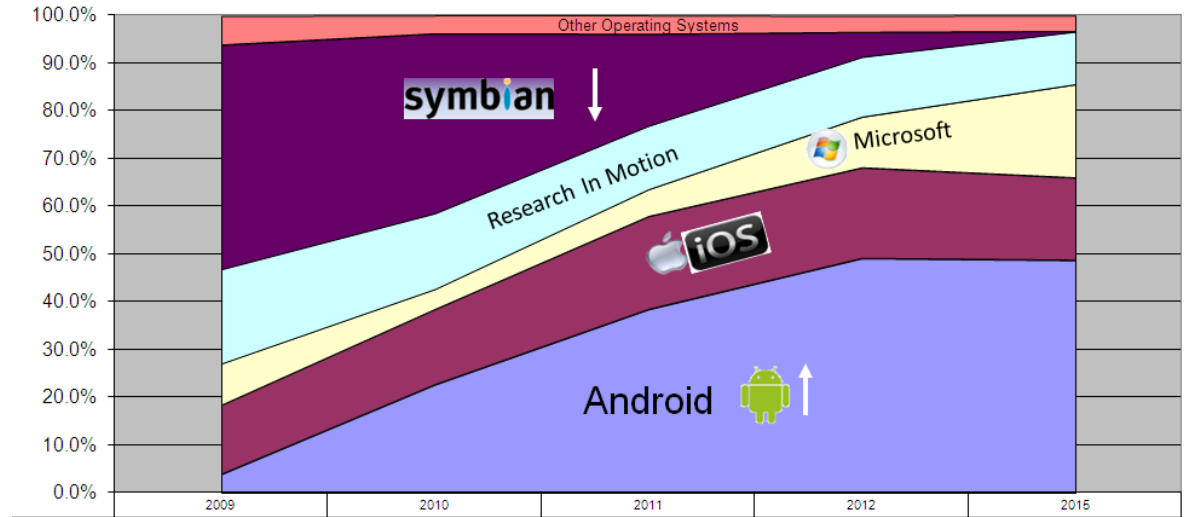
Oct 2009 -> Android 12.9% By Q4 2012

May 2010-> Android 18.0% In 2012

Aug 2010-> Android 22.2% In 2011 (note 2011 not 2012)

Apr 2011-> Android 49.2% in 2012

http://www.gartner.com/it/page.jsp?id=1622614

"App Stores…The New Life Blood of A Platform"

By Jan 2009 Approximately 300M Smartphones Already In Service

Apple App Store – Jul 2008
Android Market – Oct 2008

Sept 2011 Apple App Store:
*   >476K Apps*
*   >106K Publishers*
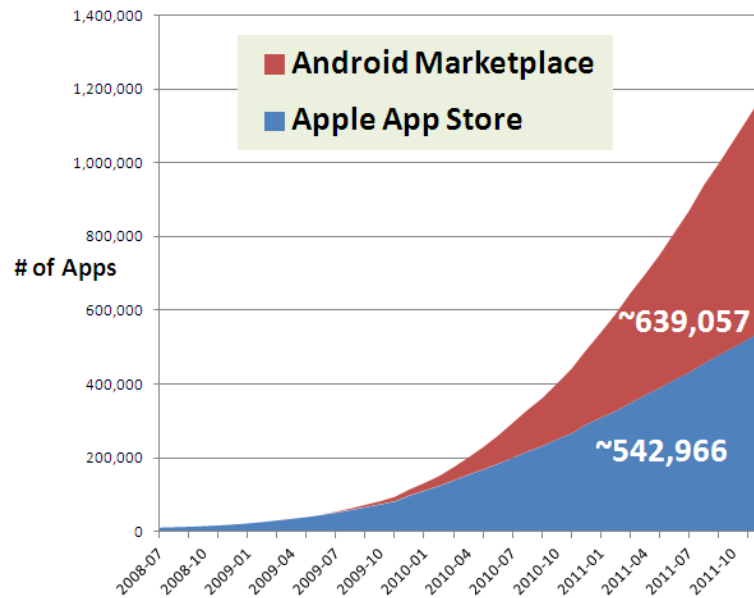*   >250K App Adds In 12 months*

By EoY 2011 ~388M Android & IOS Devices In Service with ~1.18M Respective Store Apps

@ $50K Per App Development Development Costs:
**   ~$59,050,000,000**

(1) http://www.gartner.com/it/page.jsp?id=1529214

Cumulative WW Smartphone Shipments & ~In-Service (units)
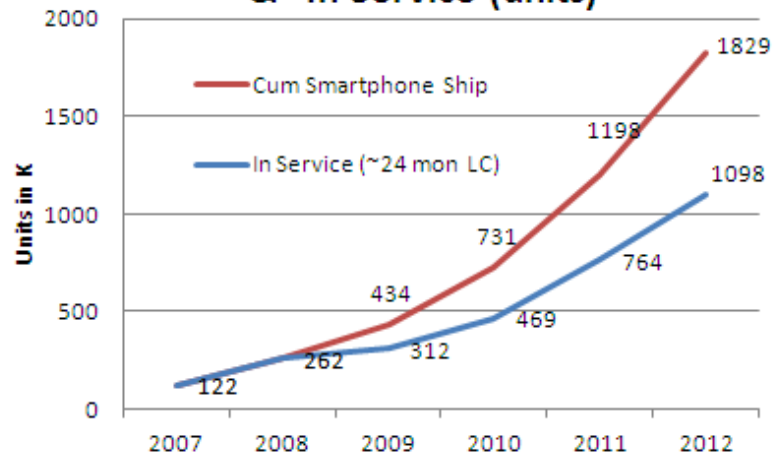
~ Android & Apple Cumulative Application Counts Through 2011

201x The
"Mobile Application Decade"

In 2011 The # of App Downloads Will Exceed World Population by 2.5x……17.8B (81% free)

In 2011 Revenues From Downloads/Advertising Will Exceed The 2010 GPD of 83 Nations…..$15.1B

From 2008 to 2014 More Than 185B App Downloads

In 2016 45B Downloads
(analyst Ovum Applications)

Chart labels: 6.96B — Sept 2011 World Population; 17.70B — 2011 WW Mobile Application Downloads
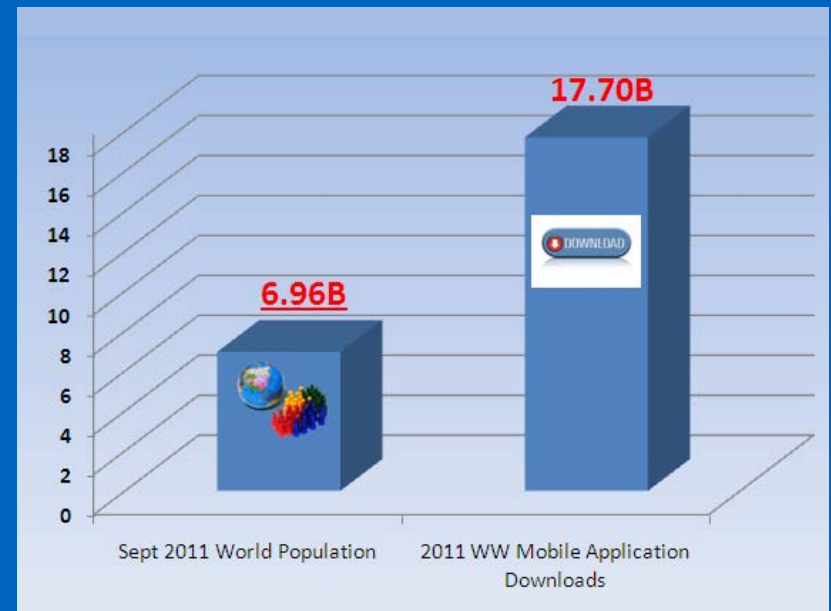
| 107 | Botswana | 14,857 | 122 | Mozambique | 9,586 | 136 | Nicaragua | 6,551 |
108	Equatorial Guinea	14,007	123	Papua New Guinea	9,480	137	Monaco	6,109
109	Jamaica	13,995	124	Armenia	9,265	138	Mongolia	6,083
110	Democratic Republic of the Congo	13,145	125	Mali	9,251	139	Moldova	5,809[nb 12]
111	Gabon	13,011	126	Macedonia	9,118	—	Bermuda	5,715
112	Senegal	12,954	127	Burkina Faso	8,820	140	Tajikistan	5,640
113	Iceland	12,594	128	Madagascar	8,721	141	Rwanda	5,628
114	Namibia	12,170	129	Malta	7,987	142	Kosovo	5,591
115	Republic of the Congo	11,898	130	Chad	7,588	143	Niger	5,549
116	Albania	11,786	131	The Bahamas	7,638	144	Malawi	5,106
117	Afghanistan	11,757	132	Laos	7,491	145	Liechtenstein	4,826
118	Georgia	11,667[nb 11]	133	Zimbabwe	7,474	146	Kyrgyzstan	4,616
—	Channel Islands	11,515	134	Haiti	6,710	147	Guinea	4,511
119	Cambodia	11,343	135	Benin	6,633	148	Montenegro	4,004
120	Brunei	10,732	136	Nicaragua	6,551	—	Isle of Man	4,076
121	Mauritius	9,729						

"Huge Cost of Platform Fragmentation"

In US 2008 ~ 2.2M Computer Software Jobs

~ 17M Software Developers Worldwide

Vision Mobile Developer Economics
- **~13 Different Platforms**
- **5-15 Months To Master Each**

Estimate Mobile App Developers	300,000	-
~ % Learning 2 Platforms	40%	-
Avg Time To Learn A Platform	10	man months
	1800	hrs
Hrs Spent Learning 2nd Platform	216,000,000	hrs
Total Cost Of 2nd Platform ($50/Hr)	**$ 10,800,000,000**	

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018
Computer software engineers and computer programmers	—	1,336,300	1,619,300
Computer programmers	15-1021	426,700	414,400
Computer software engineers	15-1030	909,600	1,204,800
Computer software engineers, applications	15-1031	514,800	689,900
Computer software engineers, systems software	15-1032	394,800	515,000
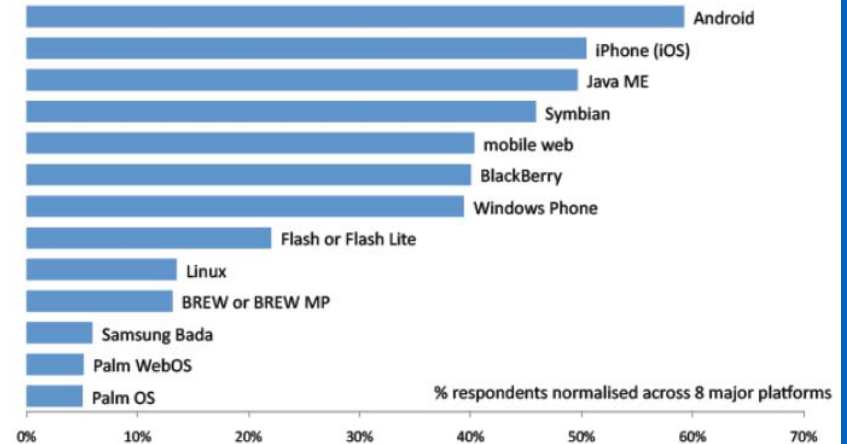
Source: Mobile Developer Economics 2010 and Beyond. Produced by VisionMobile. Sponsored by Telefonica Developer Communities. June 2010. Licensed under Creative Commons Attribution 3.0 License. Any use or remix of this work must retain this notice.

Average time required to master each platform
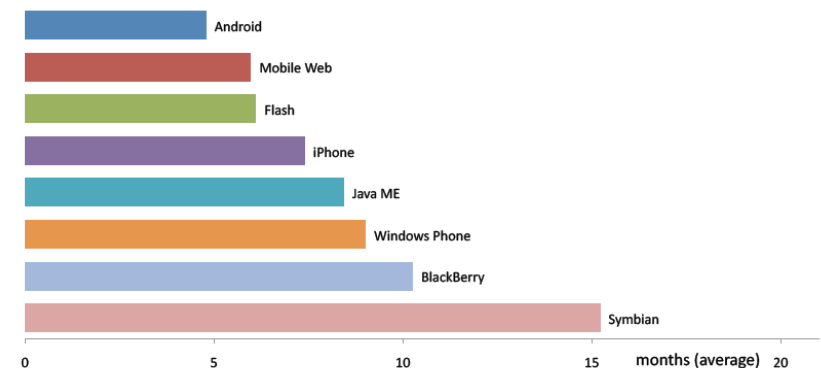
Source: Mobile Developer Economics 2010 and Beyond. Produced by VisionMobile. Sponsored by Telefonica Developer Communities. June 2010. Licensed under Creative Commons Attribution 3.0 License. Any use or remix of this work must retain this notice.

WHOSE NOT WINNING THE APP RACE

Silicon Alley Insider — Chart of the Day

Number Of Apps Available At Smartphones' Apps Stores

Legend: Jun '09, Mar '10, Oct '10, Mar '11

Data: Reports Company Releases

Apple's iPhone: 50K, 170K, 285K, 350K+
Google's Android: 5K, 30K, 100K, 250K+
RIM's Blackberry: 1K, 5K, 10K, 20K
Windows Phone 7: 1K, 9K
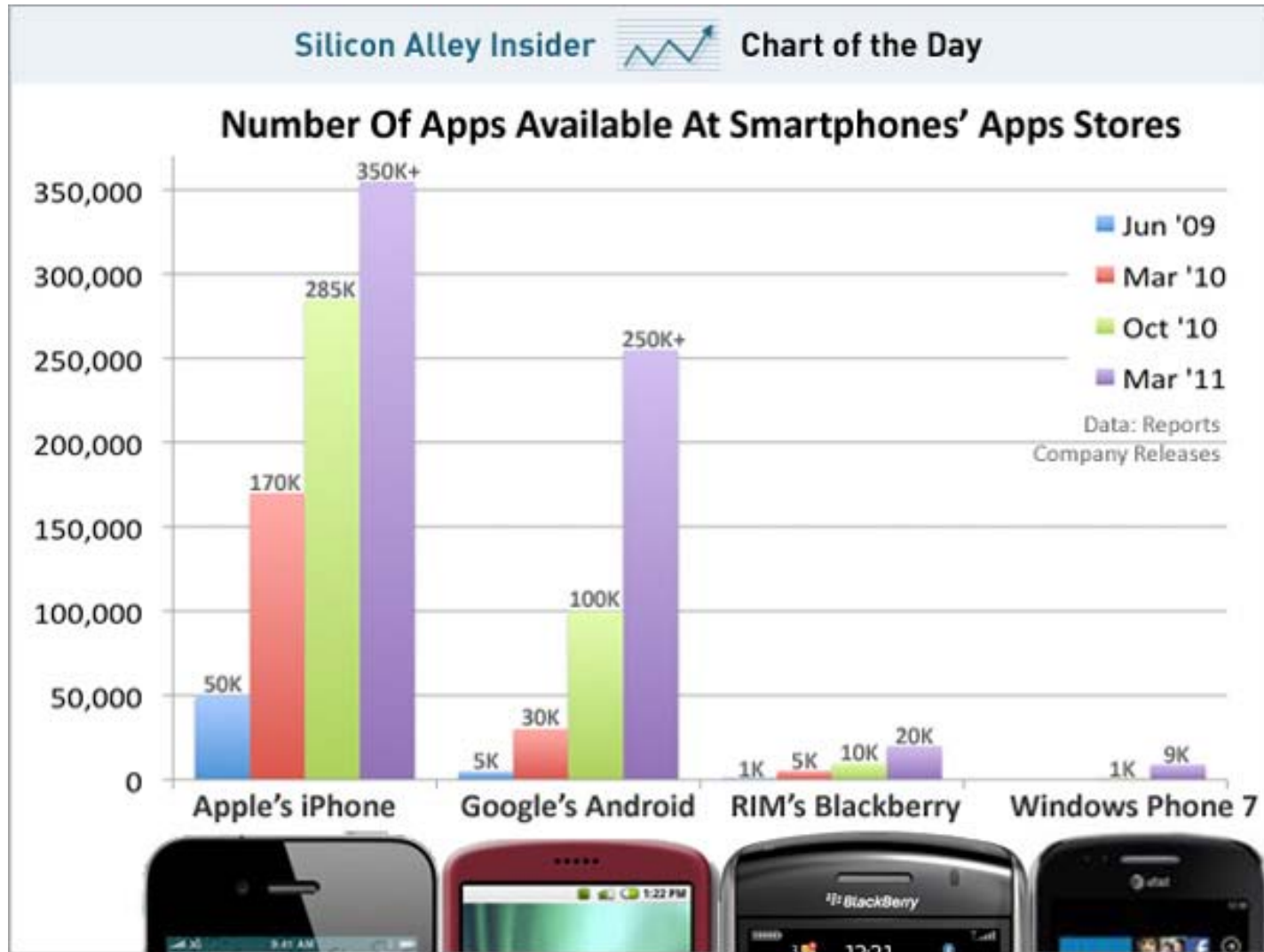
EVOLUTION OF THE OS PLATFORM
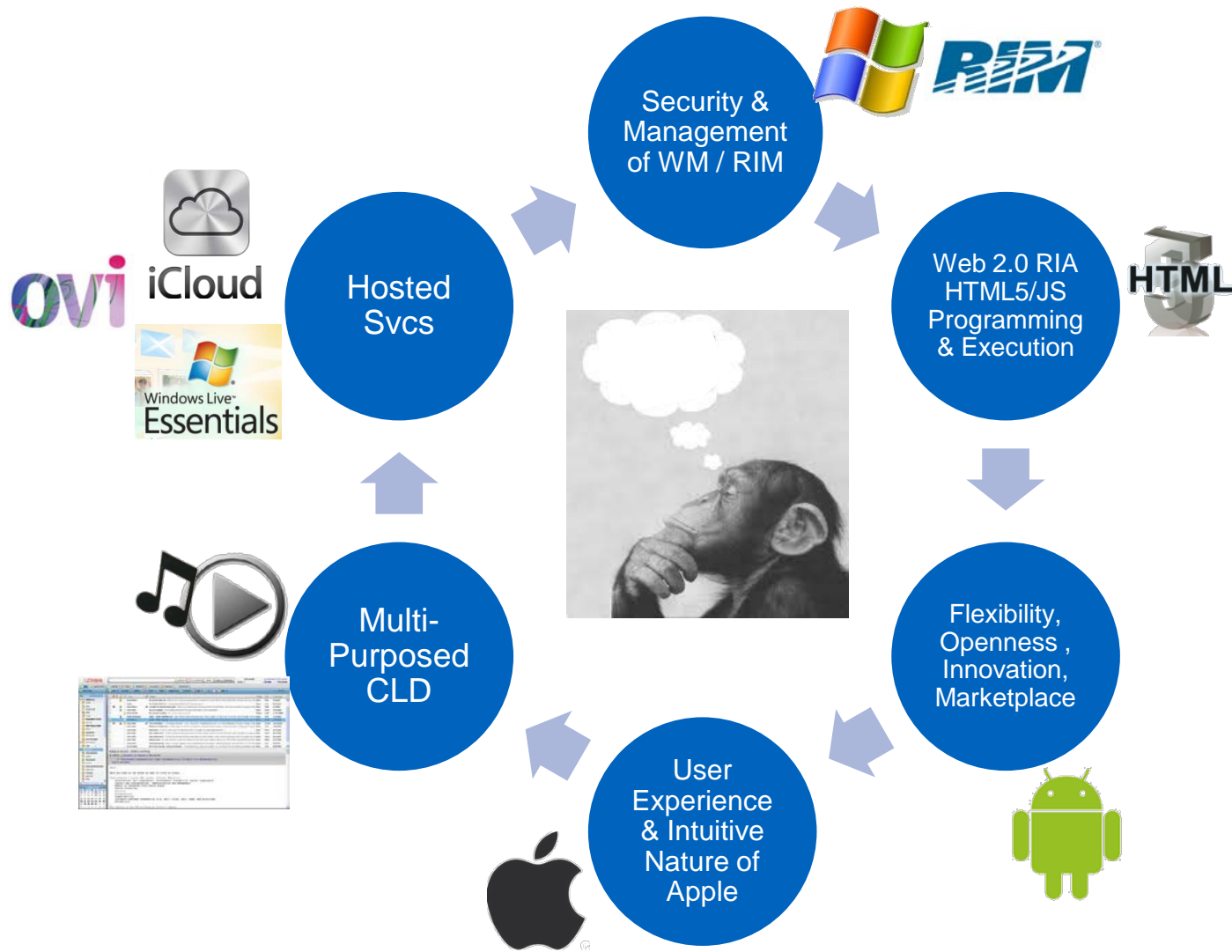
– Modular/Configurable OS/Kernel – Approximately 700 Catalog Components

– Deterministic Real-time Multi-tasking

– Streamline for small memory footprint

– Support for Multiple Processors (x86, ARM, MIPS, SH4)

– Limited Source code available (to OEMs) for customization *(& Maintenance Support*)

– Scalable Cost ("Core License", "Professional License", "Motorola Custom")

– Often Targeted For "Application Specific" Platforms
Wearable Computers, Vehicle Mount Computers, Headless devices, Set-Top-Boxes, Automotive PCs……Kernel for WM

– Recent Release

  • CE 6.0 R3: RTM Sept 09

  • ***WEC 7: RTM Mar 2011 (ARM7, SMP Support)***

- **A Comprehensive Mobile Platform, Targeting PDA and Smartphones Class Devices**

- **Based on Windows CE OS**

- **Microsoft Chooses the components from CE catalog rather than the OEM (OEMs must include all standard components)**

- **All Windows Mobile devices have same Microsoft defined feature set**
  - Microsoft requires Logo test to ensure compatibility

- **Adds Productivity Apps and User Interface Shell, control panels**
  - Outlook, Mobile Word, IE Mobile, etc.

- **Adds Dialer and cellcore programming interface**
  - CE 6 inherited Cellcore but not the dialer

Sample Features In WM, "Not In CE"
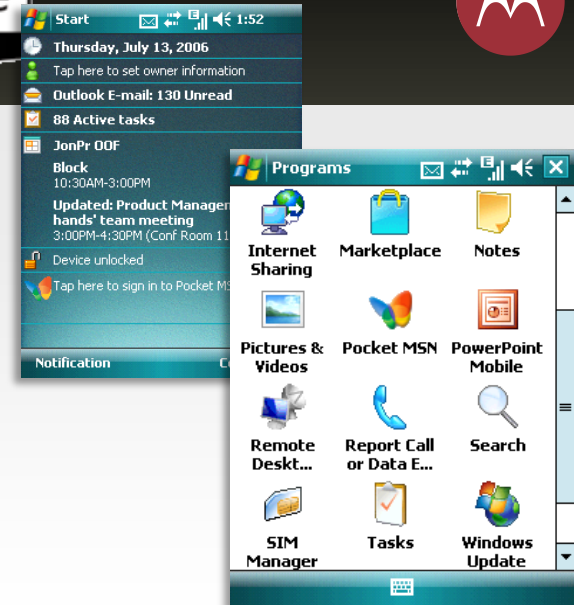
- "Platform"
- Logo Test Kit (LTK) Assures Uniformity
- New Skins & Icons (more Vista Like)
- *Outlook Mobile w/ EAS (Exchange ActiveSync) for Email, Calendar, Contacts, & Tasks*
- Exchange ActiveSync (EAS) policies
- Password enforcement
- Remote Wipe
- Windows Update for critical patches
- Mobile VPN client
- SCMDM client (Active Directory/Group Policy) support
- Phone API
- Consumer Features (MyPhone, Marketplace for Mobile, Widgets, Social Networking (e.g. Facebook Mobile) , Games, etc…)
- Customizable Home and Start screens.   Themes.
- Enhanced lock screen
- Finger friendly gesture supported UI.
- Optional; Voice Commander, VOIP application/SIP stack (residential focused)…

Windows Phone 7 (WP7)

- Consumer Focus – Zune + XBOX+ Social NW + Office

- New mobile OS on a separate branch of WinCE 7.0

- Existing WinForm Applications not compatible

- XAML / Silverlight / XNA based programming paradigm

- Limited enterprise specific features

- Initial HW "Chassis" specification is very restrictive

- UI modification prohibited

- Future "Chassis" specs discussed but not defined or committed yet

Windows Phone 7 Series Applicability for the Enterprise

Windows Phone 7 Series

Enterprise Applicability

Chassis Requirements

- Snapdragon ARMV7 Cortex
- Capacitive 3.5" Multi Touch
- HW Buttons Layout
- Screen Ruggedization

- Processor not compatible
- Capacitive screens not suitable for enterprise usage
- Keyboard requirements not flexible
- Screen requirements do not permit ruggedization
- No flexibility in selecting HW components

Application Development

- Silverlight & XNA
- Managed Code only
- Only MSFT Apps run in background
- Data Storage – Isolated Storage
- Push through Cloud – Azure

- No support for WinForms
- No backward compatibility with WinMo
- No 3rd party background apps
- No SQL Mobile support for offline apps
- Cloud services model not adopted by all enterprise customers

Security Management

- Applications require valid market place license
- Management via Azure / Market place

- Lacking Data, File & External Storage encryption
- Lacking MDM capabilities
- Missing Life Cycle Management

Windows 8

ARM & X86 Processor Support

SoC Support: TI, Nvidia, Qualcomm…tbd

Touch-centric interface (but still w/key support)

Phone7 Like "Tiled" UI

Always On / Always Connected with Low Power States
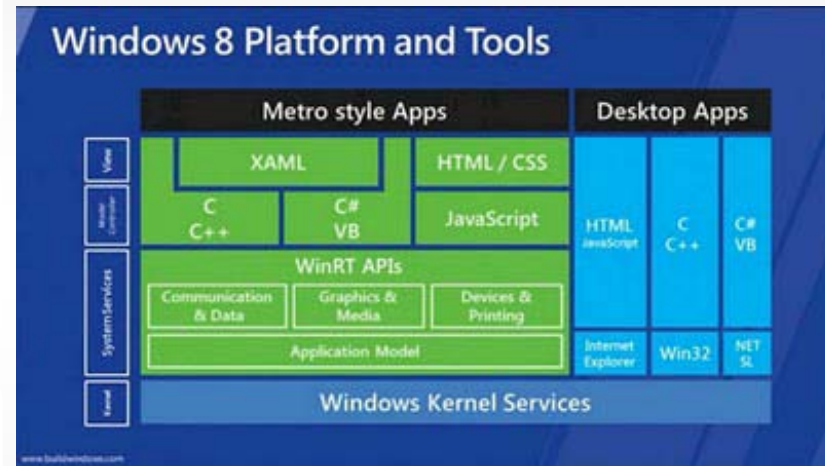
For free.

In Anthropological Terms – "Gift Culture"
members compete for status by giving things away

Antithesis of Brooke's Law
(Mythical Man-month)
– adding manpower doesn't
always imply more productivity

8   © 2008

Symbian Foundation

OS/Platform Trends

Pre-1990's Device/Vendor Proprietary	• Custom Embedded RTOS • E.g. PSOS, VRTX, MTOS… • Primarily Kernel with low level services
Mid 1990's - 2015 Extensible Vendor Proprietary	• Emergence of Java/JVM, .NET – Managed Code • Published API's • OS =>"Platforms" Targeting HH Devices • Proprietary- Microsoft , Apple, "Symbian" (pre-2008) …
2005 – Ω Open Source Hybrids	• 2007 – Linux Mobile (LiMo) • 2007 - Open Handset Aliance (OHA)/Android • 2008 - Symbian Goes Open – Symbian Foundation • (2012 – Rumors BADA May Go Open Source)
2011-Ω "Mobile Web or Web OS"	• Web Programming Environment • Renewed Fervor of Write Once Run Everywhere (cross-Platform) • Web & Local Execution Models • FLASH, Silverlight, AJAX, Chrome, Widgets, CSS HTML5, JS….

✓ Avoid Single Company Reliance & Self-Interests
✓ Foster Widespread Collaboration

Is Linux/Android A Potentially "Disruptive Technology"

Figure 2: Testing for Attributes of Disruptive Innovation

Product/Service Attribute	Explanation of Advantage or Limitation
Lower Price	Price is usually significantly lower than existing solutions, and the cost structures for organizations leading the disruptive innovation are proportionally lower.
Greater Convenience/ Simplicity	Product or service is generally simpler to acquire, use, and maintain, or involves a simpler and more convenient process for doing business.
Comparatively Inferior	Appears inferior when compared to existing products or services (example: bandwidth of WiFi vs. 100BaseT Ethernet). At their outset, disruptive innovations do not meet the needs of mainstream customers in established markets, cloaking their potential threat in the future.
Unique Capability & Value	Provides distinctly unique value, despite inferior capabilities to existing products or services (example: wireless/cellular phone service vs. traditional landline phone service).
Leverages a Lower-Cost Business Model	This attribute allows disruptive innovators to remain profitable while selling at price points that fall below the break-even point of incumbent market leaders. Over time, disruptive innovators can effectively profit by serving market leaders' lowest margin customers.
Targets an Underserved or New Discrete Market or Market Segment	Unique capability and value do not directly address the core performance demands of customers for existing products and services. Value is associated directly with a new, initially smaller market segment that is beginning to grow (example: PDAs vs. laptops & personal computers).
Pursuing a Path to Adequate Performance	A product or service becomes truly disruptive when it reaches the adequate performance threshold. At this point, the product/service meets the minimum requirements for a significant portion of customers in the established market.

"The Innovator's Dilemma", Clayton Christensen

MOMENTUM IN OPEN SOURCE MOBILE SOLUTIONS

Figure 3: Total Number of Smartphone Shipments (m) Split by Open Source and Closed Source OS 2009-2014
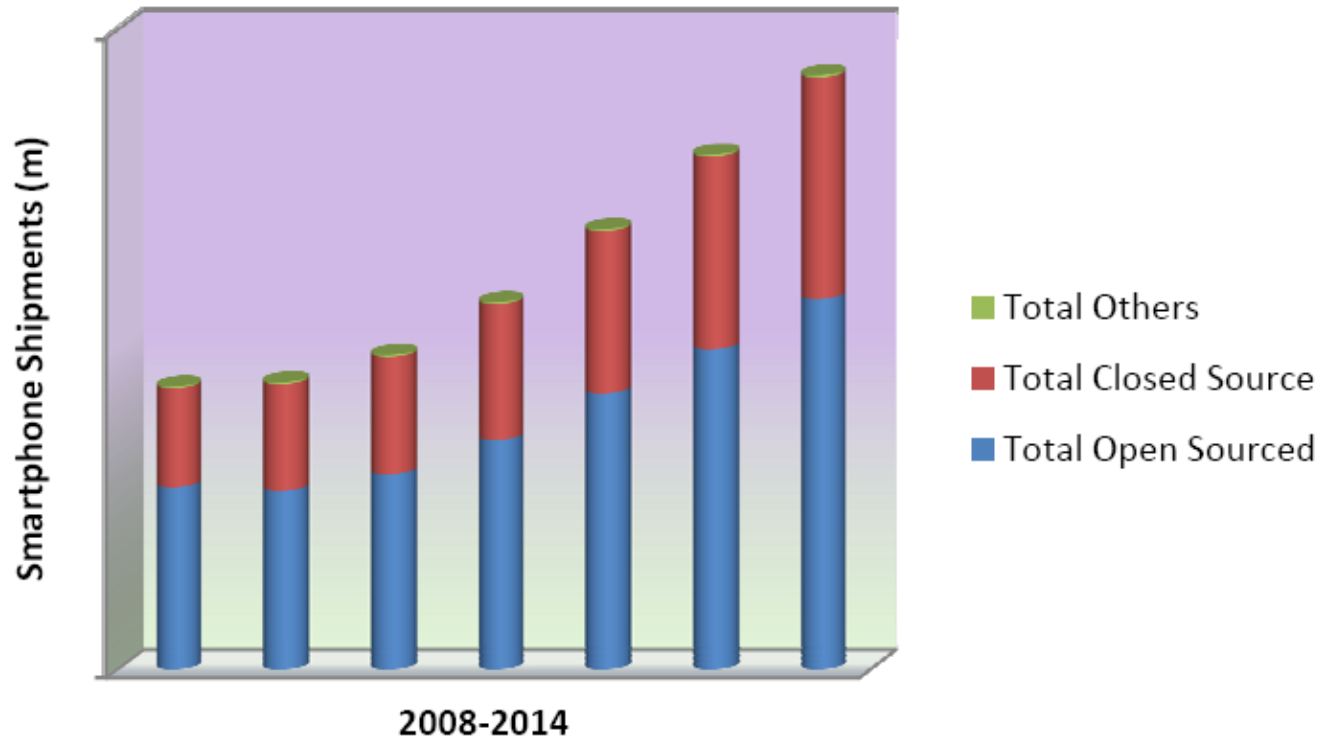
Source: Juniper Research

"Free As In Freedom" - Not Price

"Copyleft—all rights reversed"

Inalienable Rights of "Free Software"

- Freedom to run the program, for any purpose.
- Freedom to modify the program to suit your needs. (i.e. access to source code)
- Freedom to redistribute copies, either gratis or for a fee.
- Freedom to distribute modified versions of the program, so that the community can benefit from your improvements.

Open Source Initiative (OSI) Offers Over 73 Copyleft Licensing Models

- Reciprocal: distributed changes must carry same license (e.g. GPL)

- **Permissive (academic) : "do whatever you want with the code", including commercial licensing**

(FOSS = "Free & Open Source Software")

**IBM & Cisco Move
Web Server Software To
Apache Open Source**

**Microsoft Now A Sponsor
Of OSS Appache Software
Foundation ($100k/yr)**

Totals for Active Servers Across All Domains
June 2000 - June 2008
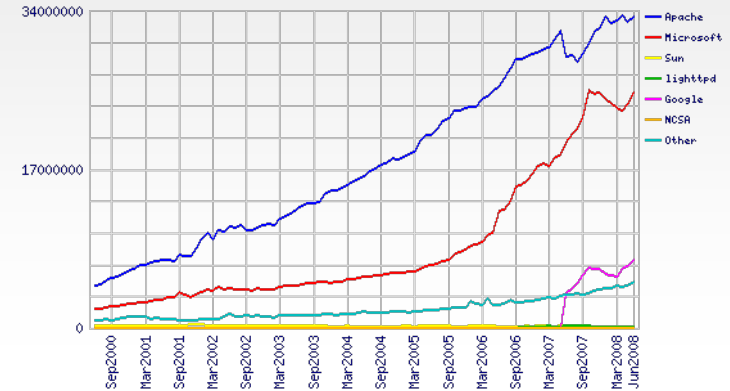
Appache Leads Web Server Mkt

Strategy – Move Tactical Software Components To Open Source
- Open Source Provides
  - Free Maintenance
  - Free Enhancements
- Benefits
  - Reduce Costs
  - Focus On Strategic Initiatives

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Complexities of Protecting Intellectual Property In An Open Source

Issues

- Sometimes Difficult To Quarantine Protected Source From Open Source

- IHV & Silicon Providers Often Have IP Built Within Their Drivers

- Exposing Register Operations Can Compromise IP by Design Inference

IP Protecting Solutions

- Closed Driver Only (can still be built into Open System)
- Closed Driver & De-Featured Open Driver

Distinguishing Features

- Supports MPEG-2 (MP@ML, SP@ML) and MPEG-1
- MPEG transport capture from digital TV demodulators
- Dolby Digital (AC-3) 2-channel
- Sampling rates of 32 kHz, 44.1 kHz, and 48 kHz with compressed bit rates up to 384 kb/sec
- 3-D adaptive comb filter with time-based correction
- Supports interlaced YPbPr inputs along with composite video and S-video
- Vertical blanking interval (VBI) data slicer
- Worldwide audio standards: BTSC, EIAJ, A2, NICAM, FM/AM Mono
- Two stereo audio processing blocks featuring three-band equalizer (EQ), volume, soft mute, auto volume control, and soft clipping functions
- AES, triple DES, and CPRM encryption

Android
General OSS Model

License	Android Stack
ASL 2.0 / "Apache 2.0"	**APPLICATIONS** — Home, Contacts, Phone, Browser, ...
ASL 2.0 / "Apache 2.0"	**APPLICATION FRAMEWORK** — Activity Manager, Window Manager, Content Providers, View System, Package Manager, Telephony Manager, Resource Manager, Location Manager, Notification Manager
ASL 2.0: DVM	**LIBRARIES** — Surface Manager, Media Framework, SQLite, OpenGL | ES, FreeType, WebKit, SGL, SSL, libc / **ANDROID RUNTIME** — Core Libraries, Dalvik Virtual Machine
GPL V2: BlueZ, GNU LibC	
GPL V2	**LINUX KERNEL** — Display Driver, Camera Driver, Flash Memory Driver, Binder (IPC) Driver, Keypad Driver, WiFi Driver, Audio Drivers, Power Management

What is A Distro ?

Wikipedia: "a set of software components (i.e. open source components) assembled into a working whole and distributed to a user community"

Kernel

IHV & Si Drivers

Linux Distributions ("Distros")

GNU Toolchain

ISV's

Community of Contributors

Open Source Foundations/ Projects

OSI Licensing
www.opensource.org

Desktop/ Laptop

ubuntu fedora debian PCLinuxOS FreeBSD

openSUSE Mandriva Linux Mint slackware CentOS

Mobile

OHA

LiMo (LiPS)

o
o
o

o
o
o

>300 Active Distros

Bundled Solution Suite

Free/Fee/ Hybrid Versions

ODM or IHV

System Integrator

"Sub" Distro

Hacktivation Energy →

"Community"
(e.g. "Totem/Xine")

Employees

Software Components

Fragmentation Nothing New To Linux

(OSS "take it and fork it")

http://blog.tweetdeck.com/android-ecosystem

FRAGMENTATION – TWEETDECK BETA RELEASE
36,427 PARTICIPANTS / OCT 2010
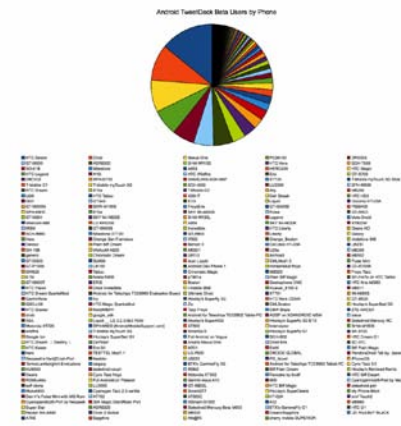
Android Phones
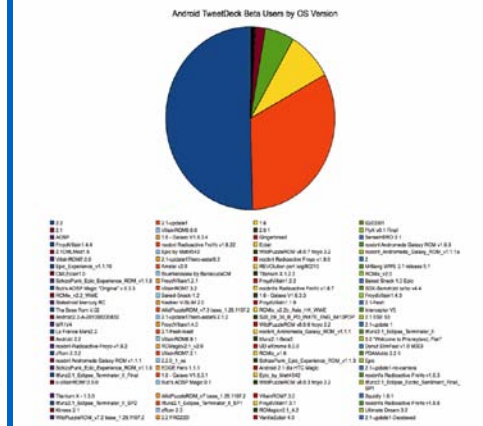
Android OS Versions
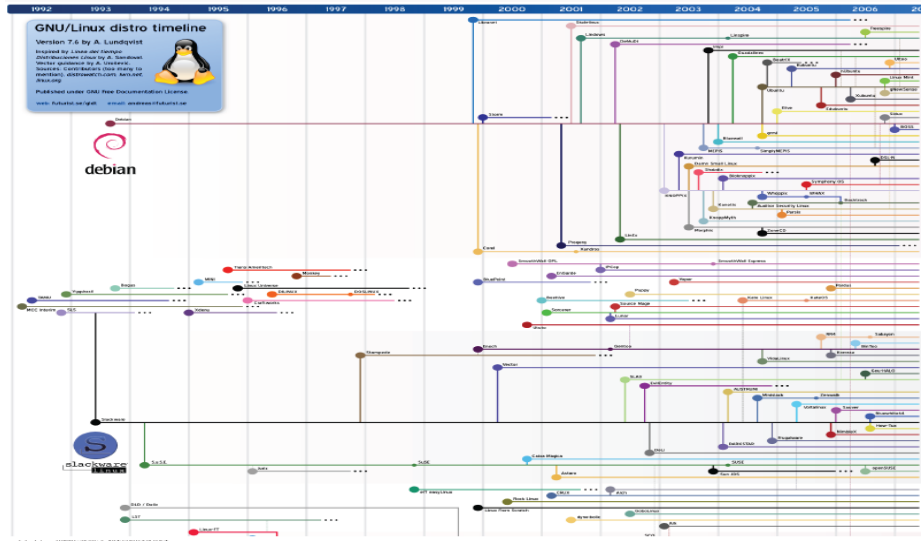
Roxio Mobile Angry Birds For All Android

Except:

Droid Eris	Motorola Backflip/MB300
HTC Dream	Motorola Cliq/Dext
HTC Hero/T-Mobile G2 Touch	Samsung Acclaim
HTC Magic/Sapphire/Mytouch	Samsung Moment/M900
HTC Tattoo	Samsung Spica/i5700
HTC Wildfire	Samsung Transform
Huawei Ideos/U8150	Sony Ericsson Xperia X10 mini
LG Ally/Aloha/VS740	T-Mobile G1
LG GW620/Eve	

What is Linux? …It Depends

Bell Labs
1969
Unix

Very Small Embedded Platforms	
Consumer Set-Top-Boxes	
Wearables	
Consumer Mobiles	
Rugged Mobiles	
Tablets/UMPC	
Laptop / Desktop	
Retail POS	
Servers	

A # of OS's Are Based On The Linux Kernel

"Sadly, a kernel by itself gets you nowhere" – Linus Torvalds

Multitasking Scheduler	Memory Manager	Virtual File System	Network Interface	Inter-Process Comm

Drivers

- **"Unix Influenced OS Written In 1991 By Linus Torvalds"**
- **Release 2.6.24 Is Over 8.5 Milllion Lines of Code**
- **Real-Time, Multi-tasking…**
- **Monolithic Kernel vs Micro-Kernel**
- **By Design New Major Release On 2-3 Month Cadence**
- **~1000 active contributors/developers in 100 companies)**
- **No Fee: GNU GPL License As Open Source at www.linux.org**
- **Kernel Derivatives Common**

Mobile OS's Leveraging Linux Kernel

palm webOS   MeeGo **(Nokia Maemo & Intel Moblin)**   bada **Samsung**   *Unix Like

Linux Monolithic Kernel

Multitasking Scheduler	Memory Manager	Virtual File System	Network Interface	Inter-Process Comm
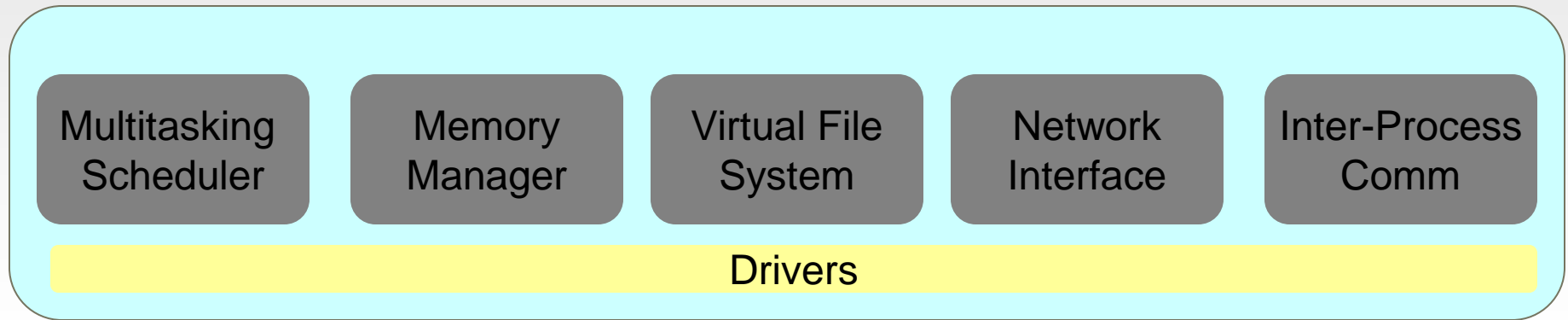
Drivers

- No Need For Driver CD, WU…(similar to MS "In-Box")
- <u>New Drivers = New Kernel</u>
- Guaranteed Driver Compatibility
- Open Code – No IP Protection
- Closed Code Driver – Cannot Have Any Open Source (driver code re-use is a benefit of Linux)

Linux Kernel Maintenance
Rapid Response A Perceived Value

Kernel Version	Release Date	Days of Development
2.6.11	2005-03-02	69
2.6.12	2005-05-17	108
2.6.13	2005-08-28	73
2.6.14	2005-10-27	61
2.6.15	2006-01-02	68
2.6.16	2006-03-19	77
2.6.17	2006-06-17	91
2.6.18	2006-09-19	95
2.6.19	2006-11-29	72
2.6.20	2007-02-04	68
2.6.21	2007-04-21	81
2.6.22	2007-07-08	75
2.6.23	2007-10-09	94
2.6.24	2008-01-24	108

Release Cadence By Design 2-3 Months
(avg has been 2.7 months)

Frequent Releases Reduce Application
Backporting

~1000 Contributors Input To Each Release

~10,000 Patches Per Recent Releases

Release From Linux Foundation – Consider Distro Delay If Applicable

Choice of JDKs
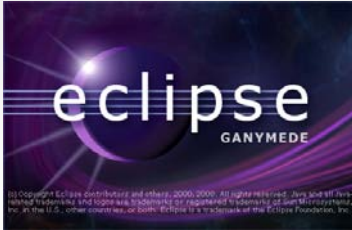
Emulator For Windows, Linux,
Or Mac Platforms
(tool-chain plug-in)

Full SKD, Tutorials…

Getting Started with Android

To get started with Android, please read the following secti

Installing the SDK and Plugin
How to install the Android SDK and Eclipse plugin.

Developing and Debugging
An introduction to developing and debugging Android
IDEs.

Hello Android
Writing your first Android Application, the ever popular

Anatomy of an App
A guide to the structure and architecture of an Android
that make up an Android app.

Notepad Tutorial
This tutorial document will lead you through constructin
edit and delete notes, and covers many of the basic co

Development Tools
The command line tools included with the SDK, what th

Application Model
A guide to Applications, Tasks, Processes, and Threa
application is run by the system and presented to the u

Application Life Cycle
The important life-cycle details for Applications and the

(Took Me ~3 Hours To Install Tools and Get
"Hello World" Running On Emulator
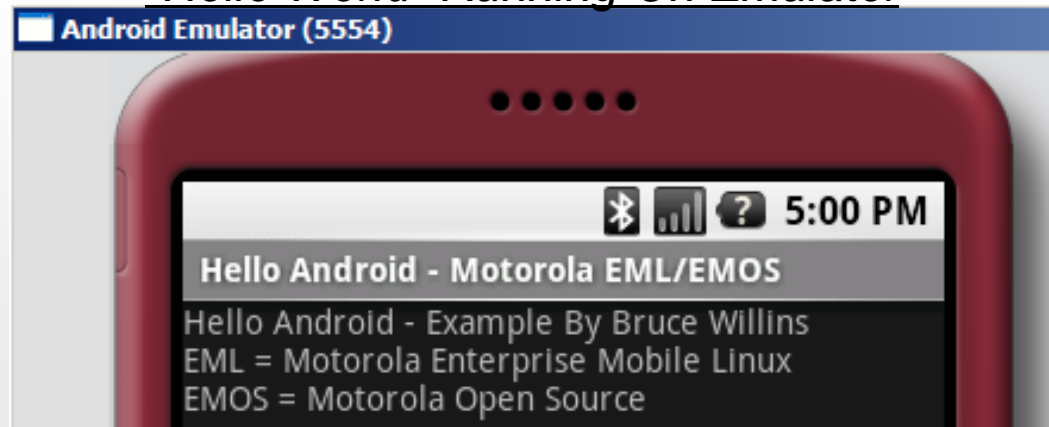
- **Google Acquired Android Inc in Aug 2005**

- **OHA**
  - Formed in Nov 2007
  - 48+ Members: Handset, Mobile Operators, Chips, Software, Commercialization
  - G1 Handset Announced Oct 2008 (T-Mobile & HTC)

- ***Android Developer Challenge* - $10M In Awards For Best Applications, 1787 Submissions**

- ***Licensing***
  - Linux Kernel (GPLv2 - "Reciprocating" License)
  - User Space (Apache Software License - ASLv2)
  - Android Development Tools (ADT) Eclipse Plugin (EPL1)

- ***Android Applications – Java & Execute Within A Dalvik VM***

- ***Profile; 39 device manufacturers, 550K devices activated/day, 231 carriers, 123 countries,***

WHAT'S IN IT FOR GOOGLE?
"SERVICES & SEARCH"

- More Users For Google Online Services

- Home Screen Google Search Box

- First Run Request For Google Account (brings in your contacts)

- e-mail, photo sharing, and social networking

- Dedicated G-Mail Application

Why Android ?

2007 Average Mobile Handset BOM

Display	22%
Baseband/RF	17%
SOFTWARE	15%
Camera	12%
Mechanics	7%
Memory	8%
Other	19%

By 2010, software cost (closed OS) will exceed 30% of BOM

* Source: Venture Development Corporation (Aug. 2007)

Google Marketing $

"Zero Cost"

No Single Vendor/Supplier Bias/Dependency

Touch Friendly UI

Customizable UI for Branding

Open To Customization

Vibrant Marketplace

Carrier Independence

OSS Flexibility

Maturity of Linux Kernel

EXAMPLE OF GOOGLE/ANDROID CYCLE
E.G. MOTOROLA MOBILITY XOOM

Google selects / works closely (Joint Dev – JD) with Hardware vendor on development for major release

SDK Preview

Release of JD product to public / retail (e.g. Xoom Feb 24)

Release Final SDK , OK To Publish Apps

Release Source Code (e.g. HC 3.0 – still pending)
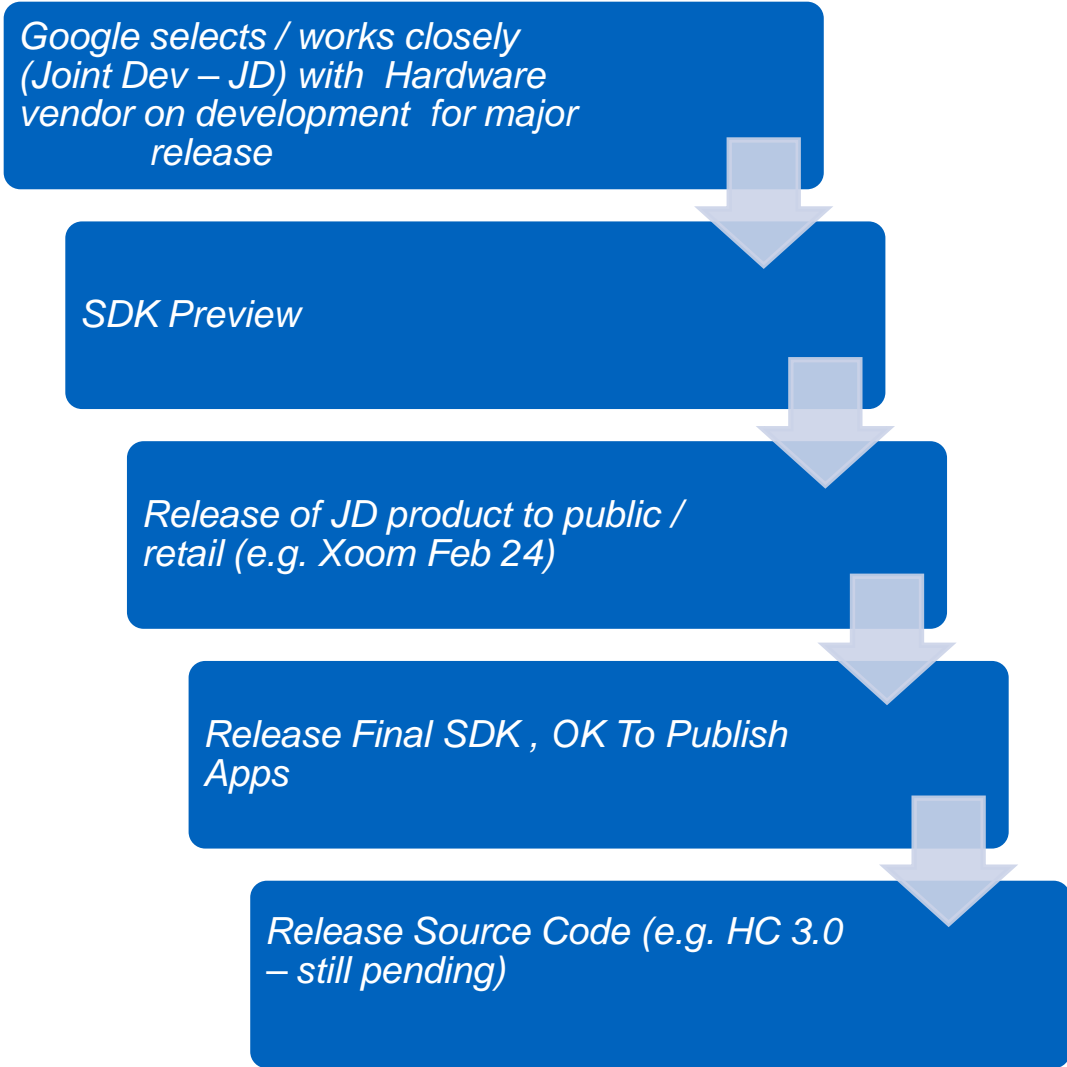
Honeycomb 3.0 Jan 26, 2011

Retail Product Release Feb 24

+ 0-3 Wks Typical (Feb 24)

Normally Shortly After Final SDK

Android Release Lag Times OS-To-Device
Consumer Feature Releases Should Not Drive Enterprise Churn

ANDROID'S LAW: MANUFACTURING CYCLES ARE GETTING SHORTER

Average lag time, in months, between an Android update's release and the launch of phones based on it.

9.7 Months	**9.1 Months**	**7.9 Months**	**6.7 Months**
ANDROID 1.5 CUPCAKE 4/09	ANDROID 1.6 DONUT 9/09	ANDROID 2.1 ECLAIR 10/09	ANDROID 2.2 FROYO 5/10

RELEASE-TIME DATA INCLUDES AN AVERAGE OF ALL DEVICES RELEASED ON THAT ANDROID VERSION SOURCE: PRTM

- *Forgo First To Market For Increased Testing & Value Adds*

- *Reduce Unnecessary IT Administrative Release Burden*

- *Release Enterprise Critical Patches In Real-Time*

http://money.cnn.com/2011/01/31/technology/new_smartphone/index.htm?iid=HLM

10 Major/Minor Releases in 30 Months
Maturity & Rate of Releases Are Issues For Enterprise
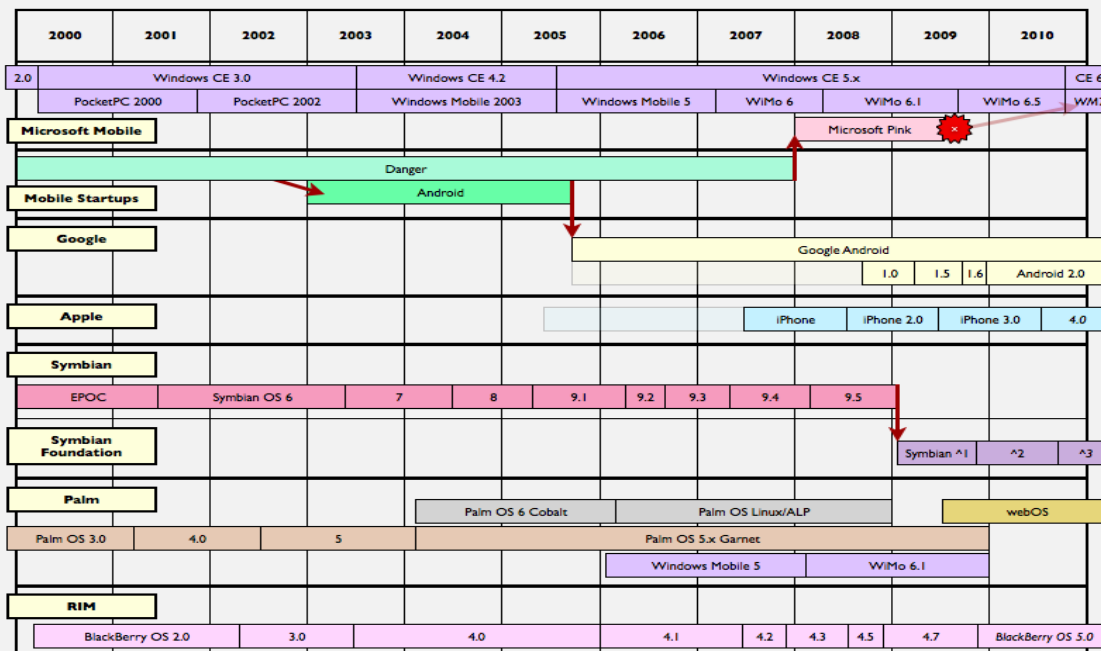
The first Éclair based Phone
Motorola Droid

Android Releases
1.0 Sept 2008
1.1 Feb 2009
1.5 May 2009
1.6 Oct 2009
2.0 Nov 2009
2.0.1 Dec 2009
2.1 Jan 2010
2.2 May 2010
2.3 Dec 2010
3.0 Mar 2011
2.4 Apr 2011

Android 1.1 (Petit-Four): released mid Feb '09, primarily bugfix release
Android 1.5 (Cupcake): pre-release mid Dec, official release April
Android 1.6 (Donut): pre-release June, official release mid Sep
Android 2.0 (Éclair): released November 2009
Android 2.1 (Eclair): January 2010
Android 2.2 (Froyo): May 2010 EAS remote wipe, strong authentication...
Android 2.3 (Gingerbread): Dec 2010
Android 3.0 (Honeycomb): Feb 22 SDK release, Source Release TBD
Android 2.4 ("Gingerbread"-2) Apr-Jul 2011?, Android 3.1 (Ice Cream): Summer 2011

Gingerbread 2.3
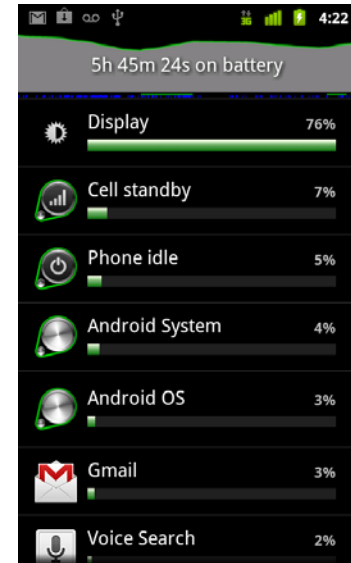
- Black background (for emissive displays)
- Quick App Shutdown (Home screen shortcut)
- **"Extra" Large Screen Support**
- Fade to center shutdown
- New You Tube Application
- ***NFC Support (Reader)***
- Google Web-M/VP8 Video Format
- ***Sensor Support (e.g. Gyroscope for 6DF)***
- New Audio Effects (reverb, equalizer…)
- ***Support For Front-Facing Camera***
- Native SIP VoIP Support (with SIP account)
- More Spacing in Keyboard / Long Press For Numbers or punctuation / Pop-Ups, Improved Prediction, Slide Text Cursor Control
- ***Multilanguage Keyboard Support***
- Downloads Manager (easy access to all downloads)
- Copy/Paste
- Pencil in Search
- Power Consumption Graph / Duty Cycle Charts

Honeycomb 3.0
First Tablet Release / Code Fork – Presumably Merging on Ice Cream Sandwich

- New UI (system bar bottom of screen – running apps…, action bar top of screen)

- **HH Application Compatibility (manifest change)**

- **Full disk Encryption**

- **Stronger Password Support (1- expiration, 2- avoid duplication, 3-force complex)**

- **SMP Multi-Core Optimizations (even for single-threaded apps), i.e. DVM Now Multi-Core Optimized**

- Bluetooth - API Support For A2DP (stereo headset) & HSP Profiles

- Improved Keyboard (better targeting)

- Browser Update – JS access to multitouch

- DRM Framework
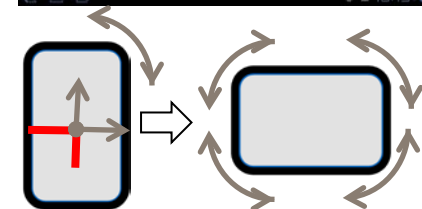
Portrait 2-Orientation
Landscape 4-Orientation

ANDROID-RELATED LITIGATION SINCE 2010

Device makers under pressure to address Android's IP infringement

Microsoft v. Barnes & Noble, Foxconn and Inventec
Mar. 21, 2011

Summit 6 v. Research in Motion, Samsung, Facebook, Photobucket
Feb. 23, 2011

Multimedia Patent Trust (Alcatel-Lucent) v. Apple, LG, Canon and TiVo
Dec. 20, 2010

Samsung v. Vertical Computer Systems
Jan. 12, 2011

Hybrid Audio v. HTC, Dell and others
Dec. 21, 2010

Hopewell Culture & Design v. Motorola, Samsung, HTC, LG and Nokia
Dec. 22, 2010

Vertical Computer Systems v. Samsung and LG
Nov. 15, 2010

St Clair Intellectual Property Consultants v. Apple and HTC
Nov. 16, 2010

Helferich Patent Licensing v. Huawei
Nov. 16, 2010

Microsoft v. Motorola*
Oct. 1, 2010

Gemalto v. Google, Samsung, Motorola and HTC
Oct. 22, 2010

Motorola Mobility v. Apple*
Oct. 22, 2010

Apple v. Motorola*
Oct. 29, 2010

Interwoven v. Vertical Computer Systems
Oct. 14, 2010

Skyhook Wireless v. Google
Sep. 15, 2010

Wireless Recognition Technologies v. A9.com and Amazon.com*
Sep. 14, 2010

Oracle v. Google
Aug. 12, 2010

Streetspace v. Google and Admob
Aug. 23, 2010

Interval Licensing v. Google and others
Aug. 27, 2010

NTP v. Google
Jul. 8, 2010

NTP v. LG
Jul. 8, 2010

NTP v. Motorola
Jul. 8, 2010

NTP v. HTC
Jul. 8, 2010

Vlingo v. Nuance Communications
Jul. 21, 2010

Microunity Systems Engineering v. Acer, Motorola, Samsung, HTC, Google, Cellco/Verizon, AT&T and Sprint* | Mar. 16, 2010

MobileMedia Ideas v. HTC
Mar. 31, 2010

Apple v. HTC*
Mar. 2, 2010

NUMBER OF LAWSUITS

MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR

MARCH 2010 - MARCH 2011

http://fosspatents.blogspot.com   Twitter: @FOSSpatents

*There are multiple Android-related lawsuits between these parties, and the date above is the date upon which the first suit was filed.

37 lawsuits in 2 years

Jun 2011: "Report: Microsoft wants $15 per Android handset"
"ZDNet believes that the $15-per-Android-handset fee is little more than "sabre rattling" on Microsoft's part and that the company could be just fine settling closer to the "$7 range."
"Maeil Business Newspaper's sources say that Samsung is willing to pay Microsoft $10 per Android handset "

Jul 2011:   "according to a CNET report", Oracle "approaching all Google handset manufactures, asking them to pay $15 - $20 as licensing fees"

Fragmentation – Tweetdeck Beta Release
36,427 Participants / Oct 2010

Android OS Versions

Android TweetDeck Beta Users by OS Version

Android Phones

Android TweetDeck Beta Users by Phone

MOTOROLA RHOELEMENTS
BROCHURE

SO MANY MOBILE DEVICES.

YOU WANT TO CREATE AN APPLICATION ONCE THAT RUNS ON THEM ALL.

WITH RHOELEMENTS, YOU CAN.

All Roads Are Leading To HTML5 (/Webkit)

Microsoft launches contest to encourage HTML5 content creation without browser plug-ins
By Mary Jo Foley | March 1, 2011, 1:06pm PST

HTML5 Support in Internet Explorer 9
By Louis Lazaris on September 28th, 2010
Categories: Markup & Style, Web Design Articles | 42 Comments

Farewell Flash? Adobe Launches HTML5 Web Animations Tool "Adobe Edge"
By Sarah Perez / July 31, 2011 9:02 PM / 20 Comments

MARCH 07, 2011
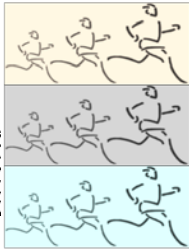"Wallaby" Flash-to-HTML5 conversion tool now available
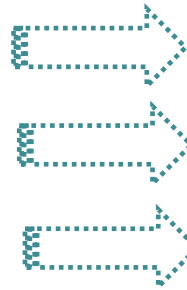
FLASH

Safari Browser

Jun 2011 "On over 500 million handsets to date" - VisionMobile

We've Been Here before?

WORA

Java 1.0

~1995

→ JEE (Enterprise)

→ JSE (Standard)

→ JME (aka. J2ME)

Apple Newton PDA	
2000 – Compaq iPAQ	SmartPhone
1997 – Palm Pilot	
'06 Intel Strong Arm SA-110	Dual & Multicore SMP's

CPU 200 MHz	6x	1.2GHz+
.35 micron	800x	45nm
16M/16M Memory	62x-1000x	1GB / 16GB

MOTOROLA *SOLUTIONS*

THE FOUNDATION IS COMING TOGETHER

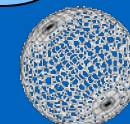**Multicore Ghz+ Processors With Significantly Enhanced GPUs & Memory**

Performance – Exponential Increase, ~3x < 1 yr
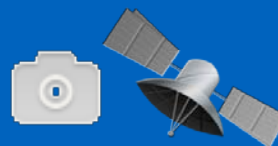
HTML 5 / Webkit (on >500M HH's)

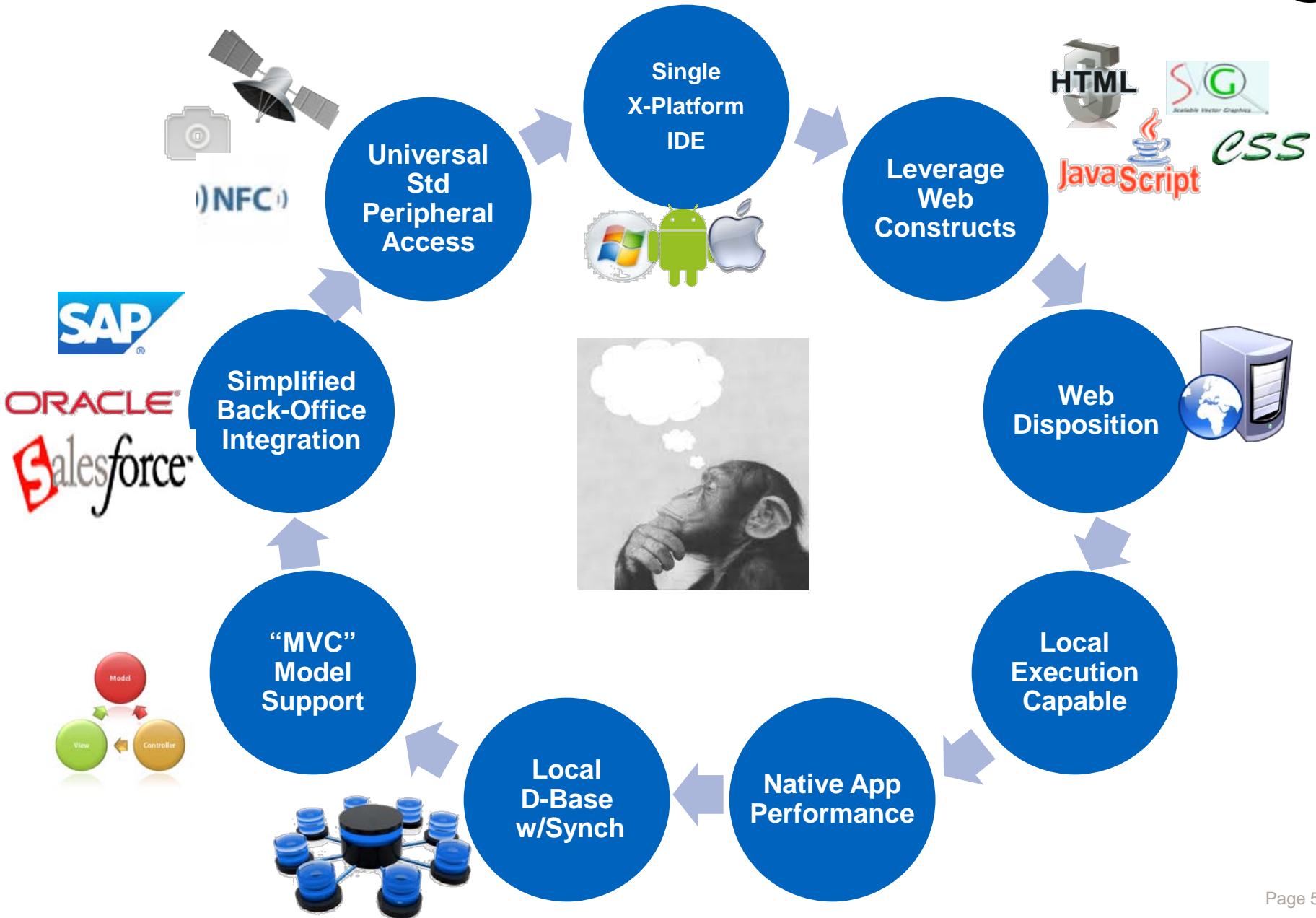**Increased Awareness Of The Need For Normalized Peripheral Support**

Mobile Development Framework

CONCLUSIONS

Slow Convergence of Mobile OS's – Increased "Enterprization" of Android

Accelerated OS Abstraction - Increased Standardization & Prolonged Coexistence of Both Web & Native Applications

Slow But Continued Standardization of Deep Device Peripheral Access

Growth of Cross-Platform MDF's But Instantly Crowded (MCAPs, MEAPs, Hybrids…)

Confluence of Consumer & Enterprise Platforms With Continued Proliferation of Purpose Built Devices

MOTOROLA
RHOELEMENTS

DEVELOP LESS.
RUN MORE.